

## EFFICACY OF SEATED BALANCE EXERCISES WITH SENSORY FEEDBACK ON BALANCED SITTING AMONG HEMORRHAGIC STROKE PATIENTS

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### ABSTRACT

#### Introduction

Stroke is the most common cause of disability or dependence in activities of daily living. The prime area where concern is needed is sitting balance to establish all physical tasks comfortably in spite of multiple problems existing as a result of stroke during the early recovery period. As a prerequisite for early functional activities, sitting balance is a valuable practical function, for physiotherapists to investigate. Good sitting balance has been identified as a predictor of recovery, post stroke. Progressive physiotherapy training is essential in the early stages of rehabilitation, as soon as the patient recovers from shock.

#### Aim

The aim of the study is to compare the effectiveness of seated balance exercises, with sensory feedback on balanced sitting performance in right versus left hemi paresis subjects, following hemorrhagic stroke.

#### Objectives

- To find out the Pre and Post measures of Trunk Impairment Scale score, among right and left hemiparetics.
- To analyze the post values of TIS between right and left hemiparetics, after 5 weeks of seated balance exercise training.

#### Procedure

To show homogeneity, 32 subjects of hemorrhagic stroke survivors with equal number of male and female hemi paretic stroke patients, within 4 weeks post stroke period were included in the study. Subjects who were medically stable were assessed using Trunk Impairment Scale and Pre test scores were documented. Both the groups were treated with seated balance exercises, for balanced sitting for 5 weeks. After the treatment duration, the subjects were again assessed by Trunk Impairment Scale and the Post test scores were documented. The scores thus obtained were statistically compared between the two groups.

#### Conclusion

The study concluded that, following physiotherapy with seated balance exercises with sensory feedback has shown a significant improvement in sitting balance, of Hemi paretic survivors from hemorrhagic stroke, with the Trunk Impairment Scale as a measure. A statistically significant improvement was seen in Right Hemiparetics, when compared to Left Hemiparetics.

**KEYWORDS:** Activities of Daily Living (ADL), Trunk Impairment Scale & Cerebral Blood Flow

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## INTRODUCTION

Stroke is the most common cause of disability or dependence in activities of daily living (ADL).<sup>1</sup> Grieving is a gradual healing process that takes time and work. Each person moves at his or her own rate and form. Passing through the stages of shock, denial, reaction and acceptance, the mobilization stage follows emotionally with behavior changes in stroke survivors. One-sided neglect occurs when the stroke survivor is unable to pay attention to one side, so that they are missing literally half of the world around them. The prime area where concern is needed is sitting balance, to establish all physical tasks comfortably in spite of multiple problems existing as a result of stroke. Multisensory activation is helpful in activating motor performance, but this does not show a lasting effect on learning. According to Wulf and Mornell (2009),<sup>2</sup> sitting balance is not a functional activity, but the ability to maintain or attain sitting balance is believed to be necessary to perform functional activities such as, dressing and transferring.<sup>3-5</sup> Some studies have found that, sitting balance at an early stage could predict activities of daily living (ADL) outcome, at a late stage in patients after a stroke.<sup>4-7</sup> To investigate a simple measurement to predict functional outcome after stroke, we estimated sitting balance using a modified mobility measurement: maintenance of a sitting position for 10 min (10-min sitting balance).<sup>8,9</sup> As a prerequisite for early functional activities, sitting balance is a valuable practical function for physiotherapists to investigate. Many other studies have looked at the predictive value of sitting balance in the stroke patient, but were performed in the sub-acute or rehabilitation phase.<sup>10</sup> Hemi paretic stroke patients frequently present balance abnormalities. Balance impairments increase fall risk, resulting in high economic costs and social problems.<sup>11-14</sup> Tailoring efficient therapeutic approaches depends on appropriate evaluation of specific needs, but the best tools for balance evaluation in patients with stroke are still under debate.<sup>15, 16</sup>

Good sitting balance has been identified as a predictor of recovery, post stroke. Factors such as proprioceptive loss, spatial neglect and mis-perception are mostly positive symptoms, in left sided hemiplegics and has shown to be the major reason for impaired sitting balance to left side (Rapport, 1993).

The Trunk Impairment Scale (TIS) for patients after stroke was designed to measure, activities of daily living related to selected trunk movements, rather than participation of the trunk in gross trunk movements. The trunk impairment Scale assesses static and dynamic sitting balance and trunk co-ordination.<sup>17</sup>

Progressive physiotherapy training is essential in the early stages of rehabilitation, as soon as the patient recovers from shock. Transfer activities in the bedside, wheel chair transfer; bowel and bladder clearance in a safe mode, further rehabilitation, all depends on comfortable and well supported sitting balance.

Two main mechanisms result in stroke. Strokes can be ischemic, the result of a thrombus, embolism or conditions that produce low systemic perfusion pressures. The resulting, lack of cerebral blood flow (CBF) deprives the brain of needed glucose and oxygen, disrupts cellular metabolism and leads to injury and death of tissues (Infarction). Strokes can also be hemorrhagic, with abnormal bleeding into extra vascular areas of the brain, secondary to aneurysm or trauma. Hemorrhage results in increased intracranial pressures, with injury to brain tissues and restriction of distal blood flow. Although, it is well recognized that, hemorrhagic stroke is associated with significantly higher acute mortality than ischemic stroke, it is frequently stated that, survivors of hemorrhagic stroke have a better neurologic and functional prognosis, than their non-hemorrhagic counterparts with similar brain volume involvement or similar stroke severity.

## **Aim**

The aim of the study is to compare the effectiveness of seated balance exercises with sensory feedback, on balanced sitting performance in right versus left hemi paresis subjects, following hemorrhagic stroke.

## **Objectives**

- To find out the Pre and Post measures of Trunk Impairment Scale score among right and left hemiparetics.
- To analyze the post values of TIS between right and left hemiparetics after 5 weeks of seated balance exercise training.

## **HYPOTHESIS**

- NULL HYPOTHESIS: There is no significant difference in balanced sitting performance between right and left hemi paretic subjects of hemorrhagic stroke survivors, following seated balance exercises with sensory feedback.
- EXPERIMENTAL HYPOTHESIS: There is significant difference in balanced sitting performance, between right and left hemi paretic subjects of hemorrhagic stroke survivors, following seated balance exercises with sensory feedback.

## **METHODOLOGY**

INSTRUMENT USED: Trunk Impairment Scale

STUDY DESIGN: Experimental Study Design.

SAMPLING TECHNIQUE: Convenience sampling.

STUDY SETTING: Private hospitals from Bangalore.

STUDY DURATION: 5 weeks.

SAMPLE SIZE: 32 Subjects.

## **Inclusion Criteria**

- Left and Right Hemi paretic subjects with Hemorrhagic stroke.
- Both genders included with age group between 50 – 60 Years.
- Duration less than 4 weeks of stroke.
- Trunk Impairment Scale, a minimum score of 4.

## **Exclusion Criteria**

- Subjects with recurrent Cardio vascular accidents.
- Any other additional Neurological disorders like Parkinson's disease, Spinal cord injury, etc.,
- Gross orthopedic disorders and any deformities of limbs and trunk.
- Subjects undergone any form of surgery in the last six months.

- Cognitive deficits (Mini mental status score less than 24/30) and medically stable were included.

## MATERIALS USED FOR THE STUDY

Couch, Stool, Blanket, Pillows, Sand bag, Plinth, Bottle, Glass cup, Plastic cup, Walker without wheels and rubber grippers.

## PROCEDURE

A total of 32 subjects were considered for the study, which fulfilled the study criteria, with informed consent after explaining the physiotherapy research procedure, the patients were conveniently assigned into two groups. Group A: 16 Right sided Hemi paretic subjects, due to hemorrhagic stroke of which 8 of each gender. Group B: 16 Left sided Hemi paretic subjects due to hemorrhagic stroke of which 8 of each gender.

Subjects who were medically stable were assessed using Trunk Impairment Scale and Pre test scores were documented. Both the groups were treated with seated balance exercises, for balanced sitting for 5 weeks. After the treatment duration, the subjects were again assessed by Trunk Impairment Scale and the Post test scores were documented. The scores thus obtained were statistically compared, between the two groups.

### Seated Balance Exercises for Stroke Rehabilitation

The exercise procedure consists of 3 simple seated balance exercises for stroke rehabilitation, which can be advised during recovery process after 4 weeks minimum. Balance exercises are an important part of any stroke rehabilitation regimen, as they strengthen your core, help improve sitting posture, and help prevent falling. For performing these exercises, you will need 2 soft yoga blocks. The exercises are Side Shift, Side Elbow Lean & Leaning Cat-Cows.

## DATA ANALYSIS AND RESULTS

Group A: Pre and Post Test measures of Trunk Impairment Scale (TIS)

S. No	TIS	MEAN	S.D	t-Value	Significance
1.	Pre	6.374	1.585	11.180	p<0.001
2.	Post	15.374	2.801		

Group B: Pre and Post Test measures of Trunk Impairment Scale (TIS)

S. No	TIS	MEAN	S.D	t-Value	Significance
1.	Pre	6.062	1.525	5.903	p<0.001
2.	Post	10.312	2.441		

## CONCLUSIONS

The study concluded that, following physiotherapy with seated balance exercises with sensory feedback has shown a significant improvement in sitting balance of Hemi paretic survivors, from hemorrhagic stroke with the Trunk Impairment Scale as a measure. A statistically significant improvement was seen in Right Hemiparetics, when compared to Left Hemiparetics. This was due to the multiple problems associated with stroke and the mode of prognosis to therapy.

## DISCUSSIONS

The aim of the study was, to compare the effectiveness of seated balance exercises on balanced sitting

performance in right versus left hemiparetics survivors of hemorrhagic stroke. Trunk symmetry, selectivity of movement and normal tone are components of normal sitting balance. Treatment in sitting, therefore, entails a wide range of techniques including eliciting righting reactions, facilitating normal lengthening and shortening of the trunk side flexors, reinforcing graded trunk extension and encouraging selective activity of the abdominal muscles.<sup>18</sup> The ability to balance is maintained by a delicate interplay among the sensory, motor and cognitive systems, and changes in the ability to balance, particularly in complex situations, can occur as a result of stroke.<sup>19-21</sup>

It has been proved in many studies that, sitting balance at an early stage could predict activities of daily living outcome at a late stage in patients, after a stroke. Hence, it can be said that, good sitting balance at early stage is directly proportional to better stroke prognosis in later stages. Because, sitting balance is a significant predictor of recovery after stroke, our finding may have important implications for predicting functional improvement in hemiparetic patients. "...many scientists believe that concepts important for stance postural control will be shown to be equally valid for postural control in sitting." (Shum way-Cook, 2011, p 192)

The Trunk impairment scale is a tool for assessing trunk balance function, exclusively for balanced sitting. The reason for keeping inclusion criteria of Trunk impairment scale score to be a minimum of 4, that the patient should be able to sit without support, so that they can perform the balanced seated exercises without strain.

Trunk impairment scale (TIS): ICF level: body structure/function- Trunk control impairments in sitting. TIS examines static sitting balance, isolated trunk movements, shortening & elongation of trunk, rotation of upper trunk on fixed lower trunk, rotation of lower trunk on fixed upper trunk. The key limitation is it does not evaluate functional tasks in sitting. Verheyden 2007.

The results of our study have suggested a significant improvement in both the groups, with the physiotherapy procedure of seated balanced exercise training. The study has shown that, right hemiparetics has shown a significant progress compared to left hemiparetics. The left hemisphere plays a larger role in motor behavior; it was hypothesized that, patients with left hemispheric injuries would demonstrate greater initial deficits and slower recovery of the motor functions of gait and functional independence after injury, assessed in this study. On the other hand, because the right hemisphere plays a larger role on spatial orientation and posture, and so they would demonstrate greater deficits and slower recovery rates of the postural and spatial attention functions after injury. But, there is no validity regarding the recovery process and it depends on the neuronal plasticity and patient's involvement with therapy. It is important to emphasize that, no studies were found compared to the rate of recovery of sensory functions, muscle strength, postural control, functional independence and spatial attention, between individuals with right and left hemispheric injuries.

## **RECOMMENDATIONS**

- The study can be done with larger sample size and other functional outcomes can be considered.
- Other Neurophysiologic approaches can be utilized as and when necessary.
- Rhythmical music therapy, Mirror therapy and similar cues can also be involved as per the need of patients.

## **LIMITATIONS**

- Further follow-up in the study is required.

- Perceptual deficits and communication deficits would have been considered.

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